



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

[Handwritten signature]

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/688,965	10/21/2003	Toshiyuki Sasaki	02887.0258	7425

22852 7590 06/01/2005

FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER
LLP
901 NEW YORK AVENUE, NW
WASHINGTON, DC 20001-4413

EXAMINER

BEREZNY, NEMA O

ART UNIT PAPER NUMBER

2813

DATE MAILED: 06/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/688,965

Applicant(s)

SASAKI ET AL.

Examiner

Nema O. Berezny

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 March 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 1-7 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 8-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 10212003.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's election without traverse of claims 8-20 in the reply filed on 3-1-05 is acknowledged. Claims 1-20 are currently pending, with claims 1-7 withdrawn.

Specification

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 8-10, 14, and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by Au et al. (2001/0046738). Au discloses a method or manufacturing a semiconductor device comprising: forming a gate dielectric film (Fig.2H el.42) on a semiconductor substrate(el.40); forming a first electrode material layer (el.44) on the gate dielectric film; forming a dielectric film (el.46a) having a thickness of 5 Ang. or more and 100 Ang. or less on the first electrode material layer (p.3 para.30 lines 6-8); forming a second electrode material layer (el.48) on the dielectric film; forming a pattern on the second

Art Unit: 2813

electrode material layer (p.4 para.34); etching the second electrode material layer using the pattern as a mask, thereby exposing the dielectric film (p.4 para.34); etching the dielectric film (p.4 para.35); and etching the first electrode material layer, thereby forming a gate electrode (p.4 para.35) **[claim 8]**. Au also discloses wherein the second electrode material layer is formed of polycrystalline silicon or silicon germanium, to which an impurity is doped (p.3 para.31) **[claim 9]**; wherein the etching of the second electrode material layer to expose the dielectric film is performed by using HBr gas or a mixed gas containing HBr gas and O₂ gas as an etching gas (p.4 para.34) **[claim 10]**; wherein the dielectric film is selected from the group consisting of a silicon oxide layer, a silicon nitride layer, a silicon oxynitride layer, and a combined layer formed by laminating at least two of a silicon oxide layer, a silicon nitride layer, and a silicon oxynitride layer (implied by p.3 para.29-30) **[claim 14]**; and wherein the first electrode material layer is formed of polycrystalline silicon or silicon germanium, to which an impurity is doped (p.3 para.28) **[claim 16]**.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Au as applied to claim 8 above, and further in view of Cho et al. (2003/0224574). Au does

not disclose 2 etching steps for the second electrode material layer. However, Au would look to one such as Cho for etching flexibility because Cho discloses wherein the etching of the second electrode material layer includes etching the second electrode material layer using a first etching gas, and stopping etching before the dielectric film is exposed (p.2 para.19-20); and etching the second electrode material layer using a second etching gas until the dielectric film is exposed (p.2 para.21). Cho also discloses wherein the second etching gas is one selected from the group consisting of HBr gas, a mixed gas containing HBr gas and O₂ gas, and a mixed gas containing HBr gas, Cl₂ gas, and O₂ gas (p.2 para.21). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the two etching steps of Cho with the method of Au, wherein multiple layers can be etched in one etch based upon time with no etch stop layer (Cho - p.2 para.20) **[claims 11, 13]**.

Based upon the rejection of claim 11 above, Au also discloses wherein the first etching gas is one selected from the group consisting of HBr gas, a mixed gas containing HBr gas and Cl₂ gas, a mixed gas containing HBr gas, N₂ gas, and CF₄ gas, a mixed gas containing HBr gas, N₂ gas, and NF₃ gas, and a mixed gas containing HBr gas, N₂ gas, and CHF₃ gas (p.4 para.35) **[claim 12]**.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Au as applied to claims 8 and 14 above, and further in view of Adair et al. (6,184,151). Au does not disclose a particular dielectric etching gas. However, Au would look to one such as Adair for etching selectivity because Adair discloses wherein a third etching gas

Art Unit: 2813

used to etch the dielectric film is one selected from the group consisting of CF₄ gas, SF₆ gas, NF₃ gas, and CHF₃ gas (col.13 lines 14-17). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the etching gas of Adair with the method of Au in order to avoid etching the underlying silicon (Adair - col.13 lines 14-17).

Claims 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Au as applied to claim 8 above, and further in view of Suzuki (2002/0155714) and Doshita (2003/0235987). Au discloses wherein the etching of the first electrode material layer includes etching the first electrode material layer using a fourth etching gas until the gate dielectric film is exposed (p.4 para.35). However, Au does not disclose removing a residue from the first electrode material. Au would look to one such as Suzuki for removing all of a contaminant because Suzuki discloses removing a residue of the first electrode material layer using a fifth etching gas, wherein the fifth etching gas is one selected from the group consisting of a mixed gas containing HBr gas and O₂ gas, a mixed gas containing HBr gas, O₂ gas, and N₂ gas, and a mixed gas containing HBr gas, C₁₂ gas, and O₂ gas (p.1 para.6). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the etching gas of Suzuki with the method of Au because the residue contaminant cannot be removed after the polysilicon has been etched (Doshita – p.2 para.32) **[claims 17, 19]**.

Based upon the rejection of claim 17 above, Au discloses wherein the fourth etching gas is one selected from the group consisting or HBr gas, a mixed gas

Art Unit: 2813

containing HBr gas and O₂ gas, and a mixed gas containing HBr gas, Cl₂ gas, and O₂ gas (p.4 para.35) **[claim 18]**.

Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Au as applied to claim 8 above, and further in view of Doshita (2003/0235987). Au does not disclose removing a natural oxide layer from the second electrode material. However, Au would look to one such as Doshita for removing all of a contaminant because Doshita discloses removing a natural oxide layer formed on a surface of the second electrode material layer before the etching of the second electrode material layer (p.2 para.24). Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to use the removing of Doshita with the method of Au because the residue contaminant cannot be removed after the polysilicon has been etched (Doshita – p.2 para.32).

Conclusion


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nema O. Berezny whose telephone number is (571) 272-1686. The examiner can normally be reached on M-F 9-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2813

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

NB


CARL WHITEHEAD, JR.
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800